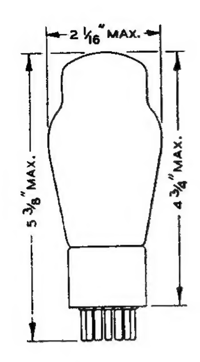
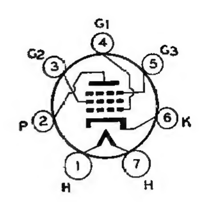


RCA-59

TRIPLE-GRID POWER AMPLIFIER



The 59 is a triple-grid power-amplifier tube of the heater-cathode type for use in the output stage of a-c operated receivers. The triple-grid construction of this tube, with external connections for each grid, makes possible its application as (1) a Class A Power-Amplifier Triode, (2) a Class A Power-Output Pentode, and (3) a Class B Power-Output Triode.

CHARACTERISTICS

Heater Voltage (A. C. or D. C.)	2.5	Volts
Heater Current	2.0	Amperes
Bulb		ST-16
Base		Medium 7-Pin

As Class A_1 Power Amplifier

	Triode°	*Pentode°°*	
Plate Voltage	250 *max.*	250 *max.*	Volts
Screen Voltage (Grid No. 2)	—	250 *max.*	Volts
Grid Voltage (Grid No. 1)	−28	−18	Volts
Plate Current	26	35	Milliamperes
Screen Current	—	9	Milliamperes
Amplification Factor	6	100	
Plate Resistance	2300	40000	Ohms
Transconductance	2600	2500	Micromhos
Load Resistance	5000*	6000	Ohms
Self-Bias Resistor	1080	410	Ohms
Power Output	1.25	3†	Watts

As Class B Power Amplifier—Triode Connection

(Grids No. 1 and No. 2 tied together; grid No. 3 tied to plate)

Plate Voltage	400 *max.*	Volts
Peak Plate Current	200 *max.*	Milliamperes
Average Plate Dissipation	10 *max.*	Watts
Average Grid Dissipation (Grids No. 1 and No. 2)	1.5 *max.*	Watts

Typical Operation (2 tubes)

Values are for two tubes.

Plate Voltage	300	400	Volts
Grid Voltage	0	0	Volts
Zero-Signal Plate Current	20	26	Milliamperes
Effective Load Resistance (Plate-to-plate)	4600	6000	Ohms
Power Output, Approximate	15	20	Watts

° Grids No. 2 and No. 3 tied to plate; grid No. 1 is control grid.

°° Grid No. 3 tied to cathode; grid No. 1 is control grid; grid No. 2 is screen.

* Optimum for maximum undistorted power output of 1.25 watts. Approximately twice this value is recommended for load of this type as driver for Class B stage.

† 7% total harmonic distortion.

INSTALLATION

The **base** pins of the 59 fit the seven-contact (0.855-inch pin-circle diameter) socket which may be installed to hold the tube in any position.

The **bulb** of this tube may become very hot under certain conditions of operation. Sufficient ventilation, therefore, should be provided to prevent overheating.

For **heater** operation and **cathode** connection, refer to INSTALLATION for type 2A5.

APPLICATION

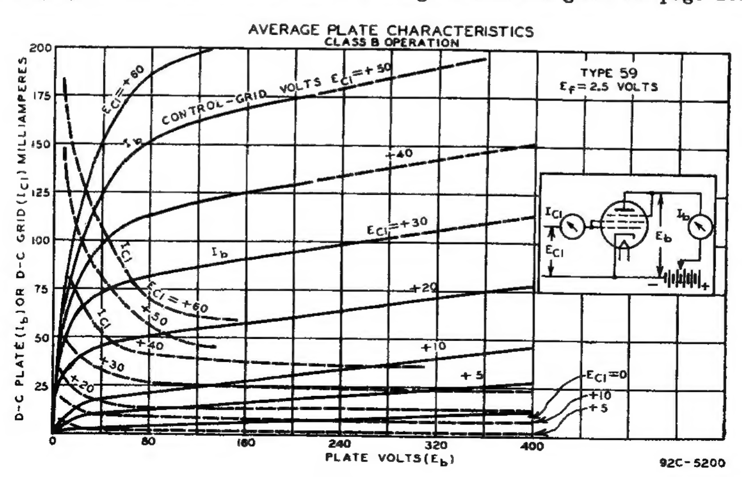
For **Class A_1 Triode Operation** of the 59, the two grids (No. 2 and No. 3) immediately adjacent to the plate are connected to the plate, while the third (No. 1) is employed for control purposes. Operation of the tube is then similar to any Class A power-amplifier triode. The tabulated values for Class A operation of this type as given under CHARACTERISTICS, are for its operation as a power-output tube. When it is used as the driver for a Class B stage, the load requirements are changed, as indicated in the note under CHARACTERISTICS. This change is recommended in order to minimize distortion due to the driver stage.

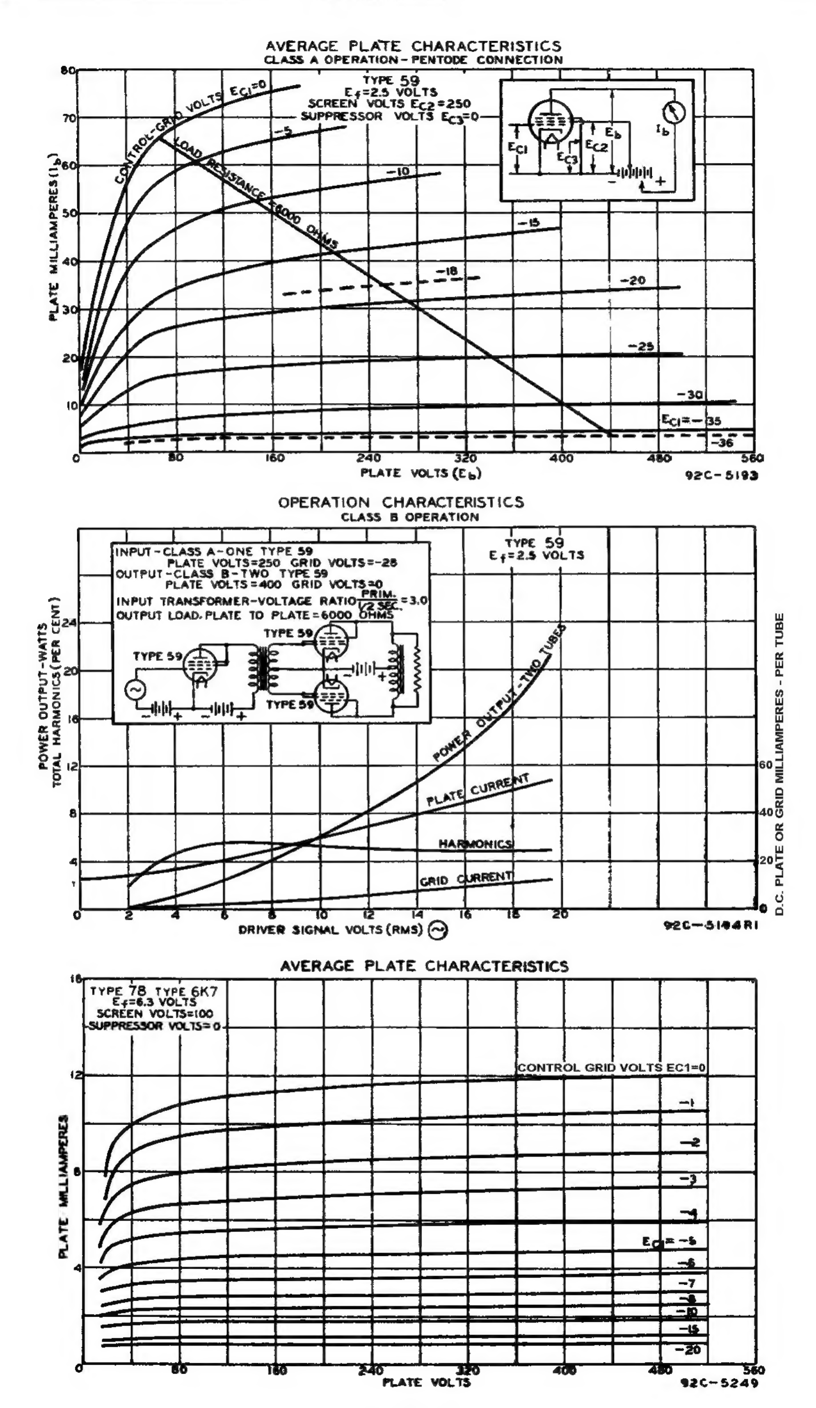
The d-c resistance in the grid circuit of the 59, operating as a Class A amplifier (either with triode or pentode connection) should not exceed 0.5 megohm if self-bias is used. Without self-bias, the resistance should not exceed 10000 ohms. The use of resistances higher than these may cause the tube to lose bias due to grid current, with the result that the plate current will rise to a value sufficiently high to damage the tube.

For **Class A_1 Pentode Operation** of the 59, the grid (No. 3) adjacent to the plate is tied to the cathode and thus serves as the suppressor, while the other two grids (No. 2 and No. 1) serve as the screen grid and control grid respectively. Operation of the tube is then similar to any Class A power-output pentode.

For either method of Class A operation, the self-bias resistor should be shunted by a suitable filter network to avoid degenerative effects at low audio frequencies. The use of the two 59's in push-pull eliminates the necessity for shunting the resistor. The value of the self-bias resistor required for two tubes in the same stage is approximately one-half that for a single tube.

For **Class B Triode Operation** of the 59, the grid (No. 3) adjacent to the plate is tied to the plate, while the other grids (No. 1 and No. 2) are connected together to serve as a single control-grid. No grid bias is necessary with this connection. This feature is particularly important because it prevents the variation of bias with applied signal which would otherwise exist if any self-bias arrangement were employed. A discussion of Class B design features is given on page 20.




AVERAGE PLATE CHARACTERISTICS
CLASS A OPERATION - PENTODE CONNECTION
TYPE 59
Ef=2.5 VOLTS
SCREEN VOLTS EC2=250
SUPPRESSOR VOLTS EC3=0
CONTROL-GRID VOLTS EC1=0
LOAD RESISTANCE = 6000 OHMS
PLATE MILLIAMPERES (Ib)
PLATE VOLTS (Eb)
92C-5193
OPERATION CHARACTERISTICS
CLASS B OPERATION
INPUT - CLASS A - ONE TYPE 59
PLATE VOLTS=250 GRID VOLTS=-28
OUTPUT - CLASS B - TWO TYPE 59
PLATE VOLTS=400 GRID VOLTS=0
INPUT TRANSFORMER-VOLTAGE RATIO PRIM./1/2 SEC. = 3.0
OUTPUT LOAD, PLATE TO PLATE = 6000 OHMS
TYPE 59
Ef=2.5 VOLTS
POWER OUTPUT - TWO TUBES
PLATE CURRENT
HARMONICS
GRID CURRENT
POWER OUTPUT-WATTS
TOTAL HARMONICS (PER CENT)
D.C. PLATE OR GRID MILLIAMPERES - PER TUBE
DRIVER SIGNAL VOLTS (RMS)
92C-5194R1
AVERAGE PLATE CHARACTERISTICS
TYPE 78 TYPE 6K7
Ef=6.3 VOLTS
SCREEN VOLTS=100
SUPPRESSOR VOLTS=0
CONTROL GRID VOLTS EC1=0
PLATE MILLIAMPERES
PLATE VOLTS
92C-5249